

Breakthrough Barriers to Knowledge Sharing Using Modern Technologies in Academic Libraries in South Africa

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ABSTRACT

In an increasingly globalized and knowledge-based economy, this study aimed to investigate the adoption of modern technologies for effective knowledge sharing and enhancing knowledge access in academic libraries. The study was underpinned by the organizational knowledge creation theory (OKCT) and knowledge sharing model. The findings reveal that although modern technologies, such as the internet of things (IoT) and blockchain technologies, have been seen as suitable knowledge sharing strategies by many institutions, the level of their adoption is still low in academic libraries in South Africa, especially in the area of knowledge management. Several recommendations are thus made, and among others are the improvement of technology infrastructure and the enactment of policies for promoting knowledge management and sharing.

KEYWORDS

Academic Libraries, Blockchain, Internet Of Things, Knowledge Management, Knowledge Sharing

Knowledge has become a strategically important resource and the performance driver for organizations, in the knowledge-based economy (Yesil & Dereli, 2013). It is regarded as a powerful strategic tool for enhancing an organization's business and competitive advantage. In this era characterized by fast change and uncertainty, the successful organizations are those that consistently create new knowledge, disseminate it throughout the organization, and embody it in technologies, products, and services (Gottschalk, 2007). Academic libraries serve as reservoir and repositories of knowledge and information from all fields of learning to ensure that knowledge is managed properly and remains accessible and available to all users and future generations of scholars. Academic institutions worldwide thus play an important role in socio-economic development through knowledge production and sharing. Amayah (2013) defined knowledge sharing as the process in which knowledge is communicated to other people across and within departments and organizations through face-to-face interactions or the use of technology. Bulan and Sensuse (2012) further described knowledge sharing as a process whereby tacit or explicit knowledge is exchanged and communicated to other individuals.

Knowledge sharing can stimulate individuals to think critically and innovatively (Aulawi, 2021). It represents a key knowledge management process in organizations and also can be considered fundamental for generating new ideas and developing new business opportunities (Lin, 2007). Therefore, to provide benefits valued by organizations, knowledge owned by individuals must be shared with the purpose of eliminating knowledge gaps among individuals and encouraging the generation of new knowledge (Aulawi, 2021). Aslam et al. (2013) were of the view that high academic performance in the university depends on knowledge sharing. Ichijo and Nonaka (2007)

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further emphasized that the most significant determinant of organizational performance depends on the level of knowledge created and shared in the organization. Knowledge sharing is thus the building block for the success of the organization as it provides a competitive edge, and organizations that are able to share knowledge effectively are more productive while also improving their performance (Baporokar, 2020). As also noted by Xue et al. (2022), knowledge sharing directly increases an organization's viability and performance while playing a nuanced moderating role in reducing the negative influence of individualism on team viability and enhancing the positive influence of team viability on performance. High-performance work practices such as incentive pay, training, sharing of information, participative management, preferential recruiting and selection, an egalitarian culture, and teamwork are all practices that contribute to organizational performance, as stated by Albakjaji and Almarzouqi (2024). Human resource management practices and their outputs, such as creative risk-taking and inventive capacities, are also a result of sustainable practice and a link between sustainability goals and organizational performance (Albakjaji & Almarzouqi, 2024). Davenport and Grover (2001) identified key contexts for knowledge sharing, namely, strategy, structure, culture, and technology, where all knowledge processes that occur among individuals, groups, and organizations can influence the context. As noted by Mueller (2012), at least two people, groups, or organizations are involved in knowledge sharing, the sender, who is willing and able to share knowledge, and the receiver, who is willing and able to combine this new knowledge with his or her existing knowledge and use it.

However, as noted by Lin et al (2008), knowledge sharing is challenging in many organizations for two reasons: First, tacit knowledge, by its very nature, is difficult to transfer and, second, knowledge sharing is typically voluntary. Knowledge hoarding is regarded as one of the top barriers to knowledge sharing within organizations. Hoarding becomes a problem when employees refuse to share knowledge; either they simply do not prioritize it or feel their self-interest is better served by not doing so. Therefore, knowledge management and sharing in academic libraries cannot achieve their objectives without implementing solutions to overcome the barriers to effective knowledge sharing. To embrace and extend their relevance in the digital transformation era, academic institutions across the globe are increasingly transforming themselves by actively adopting innovative technologies and strategies to ensure sustainable competitive advantage and to provide their patrons with high quality information in a reasonable time. Masele (2008) also advocated for the capture and prevention of the loss of critical knowledge in the universities and other public sector organizations that may be occasioned by retirement, downsizing, and outsourcing.

PROBLEM STATEMENT

Although knowledge is regarded as a fundamental resource that needs to be managed properly, knowledge sharing and management are often overlooked as part of the daily operational activities in academic libraries. Vital information and knowledge are difficult to access in various organizations and institutions due to lack of knowledge-sharing strategies and poor knowledge management. Keyes (2008) noted that the existing knowledge in public-sector organizations in the developing world is not being effectively disseminated and used due to cultural, technological, and educational constraints. Masoti and Masheka (2010) further noted that public sector organizations do not maximize the use of knowledge assets because culture, leadership, and strategies for knowledge sharing are ignored. As stated by Lwoga and Sife (2006), the universities in Tanzania do not have a systematic approach to managing knowledge in support of their core functions of teaching, research, and engagement. Bulan and Sensuse (2012) identified the lack of knowledge capturing and retention strategies from staff leaving the universities, leading to loss of vital knowledge. According to Mchombu and Cadbury (2006), the problem is compounded by the fact that staff tend to hide information, thus hindering knowledge sharing. The study by Mutula and Jacobs (2012) in the context of higher education in South Africa identified lack of integration of information and knowledge management systems as part of the challenges hampering knowledge sharing in academic institutions. As a result, academic

libraries in South Africa and worldwide are increasingly adopting modern technologies such as blockchain, cloud computing, and internet of things (IoT) technologies to mitigate knowledge sharing and management challenges.

Technological innovation has always been a key challenge in sharing and managing knowledge, although an increasing number of academic libraries have shown great interest in the implementation of modern technologies. A move from file cabinet storage systems toward the digital management systems was never painless. Even though IoT technologies have huge implications in libraries, the full integration of these technologies has not yet been achieved in the traditional libraries' ecosystem (Wojcik, 2016). The hoarding of knowledge by organizational members is one of the major factors hindering successful knowledge sharing in many organizations. Proper knowledge management continues to be a challenge within academic libraries due to a lack of sufficient skills, policy, procedures, and standards, as well as a lack of knowledge of how to utilize modern technologies in sharing and managing library records. This underscores the need for greater technical expertise for knowledge sharing and developing policies to support knowledge management practices. This study thus attempted to fill the gap that exists between traditional and modern methods of managing and sharing knowledge within academic libraries. The research objectives formulated to address this research problem were to (a) establish the extent to which modern technologies have been adopted in academic libraries for knowledge sharing, (b) determine the barriers to the adoption of modern technologies for effective knowledge sharing in academic libraries, and (c) determine the determinants for effective knowledge sharing in academic libraries.

THEORETICAL FRAMEWORK

The study reviewed different theories and models to give grounded coherence in order to recommend systems and technologies for effective knowledge sharing within academic libraries in South Africa. Organizational knowledge creation theory (OKCT) and the knowledge sharing model were used to underpin this study. The study established a relationship between concepts such as knowledge sharing, organizational culture, information and communication technology, employee knowledge and willingness known as individual factors, and knowledge of management systems and their impact on the phenomenon being investigated to provide profound understanding and explanation of certain processes, actions, events, and structures related to management of knowledge sharing in academic libraries.

Organizational Knowledge Creation Theory (OKCT)

OKCT was proposed by Nonaka and Takeuchi (1995) to explain the phenomenon of organizational knowledge creation, and it states that knowledge creation originates within the individual and develops through social interaction from individual to individual, from individuals to teams, and then from teams to the whole organization. This theory thus states that organizational knowledge is created by individuals, who share it, and finally that knowledge is turned to organizational knowledge. It emphasizes that it is the responsibility of the organization to create new knowledge, disseminate it, make it shared by the organization staff, and embody it in products, services, and systems (Nonaka & Takeuchi, 1995). The knowledge created can be shared through different channels, such as observation, imitation, face to face meetings, journals, electronic media, and more (Nonaka & Takeuchi, 1995).

The organization thus defines specific problems, identifies the knowledge, shares it, and develops new knowledge to solve the identified problems (Nonaka et al., 2000). Both tacit and explicit knowledge can be shared and eventually used to create new knowledge. OKCT has two dimensions, which Nonaka and Takeuchi (1995) described as epistemology and ontology dimensions of organizational knowledge creation. The epistemological perspective focuses on tacit and explicit knowledge. Tacit knowledge is difficult to articulate because it resides in minds of individuals and is normally acquired through experience, observation, imitation, and face to face meetings. It also needs mutual trust among

individuals for effective knowledge sharing. Explicit knowledge, on the other hand, is the knowledge that is documented, and it is easy to transfer among individuals because of its nature; it can be in hard copy or soft copy, written form, recorded, or pictorial (Nonaka & Takeuchi, 1995). The ontological dimension of knowledge creation ranges from individual to group, team, and organization, and it is also concerned with the levels of knowledge-creating entities: individuals, group, organizational, interorganizational, and technological. OKCT thus aims at explaining organizational change, creativity, and innovation based on the four modes, namely, socialization, externalization, internalization, and combination (Nonaka & Krogh, 2009).

Socialization is the process of converting new tacit knowledge through shared experiences; however, according to Salonijs and Kapyła (2013), tacit knowledge by its very nature is personal and not easy to transfer or to share. The primary aspect of socialization is that tacit knowledge is transmitted between persons by cooperative behavior such as being together, spending time together, and living in the same environment, rather than written form (Hoe, 2006). Externalization is the process that entails the transformation of tacit knowledge into explicit knowledge (Nonaka et al., 2000). Tacit knowledge is turned to explicit knowledge, it gets “crystallized,” allowing it to be shared with other individuals, and it serves as the foundation for new knowledge such as concepts, visuals, and textual content, as stated by Easa (2012).

Combination is the process whereby explicit knowledge is transferred to another explicit knowledge (Ngulube, 2003). Knowledge is collected from inside or outside the organization and then combined, edited, or processed to form more complex and systematic explicit knowledge (Nonaka & Toyama, 2003). Internalization occurs when external knowledge from documents, databases, and artifacts is used to create new knowledge inside a person that can also be transferred to others (Ngulube, 2003). Therefore, this implies that to permanently keep tacit and explicit knowledge in the human mind, knowledge acquired through socialization, externalization, and combination must be internalized. This stage is inextricably linked to learning through experience (Nonaka & Takeuchi, 1995).

Knowledge Sharing Model

The knowledge sharing model was developed by Cheng et al. (2009), and it is based on three factors: organizational, individual, and technological factors that influence knowledge sharing activities.

Organizational Factors

A viable knowledge sharing capability requires organizations to have sufficient expertise in knowledge management systems to support all of the infrastructure and requisite key processes, including ongoing professional development for personnel. Organizational factors are considered as some of the main factors enabling knowledge sharing within the organizations and comprises management support to create a climate that supports, encourages, and provides adequate resources for knowledge sharing within the organization. Connelly and Kelloway (2003) also found that perceived management support for knowledge management and sharing initiatives is an important predictor of people’s normative perceptions of knowledge sharing. Management aspects include planning for technology infrastructure, human resources, financial resources, and creation of policies to ensure successful knowledge sharing.

Management support is thus an important variable in the knowledge sharing model that harmonizes individual, organizational structure, culture, reward systems, and knowledge management and sharing policies. Noor and Salim (2011) concurred that management support helped in formulating policies and developing organizational culture and innovation in an organization. Organizational factors such as organizational culture, social networks, positive attitude, and management support thus lead to effective knowledge sharing within the organization.

Individual Factors

Nonaka and Takeuchi (1995) noted that the success of knowledge sharing in an organization depends on the involvement of individuals, since individuals are originators and communicators of information. Kwakye and Nor (2011) concurred that the creation and sharing of knowledge depends on the conscious effort of an individual who has to set the ball rolling for knowledge to be shared. Similarly, Choi and Lee (2003) supported that individuals are at the heart of organizational knowledge creation and use. Individual factors thus refer to people who create and share both tacit and explicit knowledge, and they generate knowledge by exchanging their ideas and experiences through socialization. In this regard, human assets will remain the library's greatest asset, and therefore the steps are needed to help develop and support staff to their fullest potential. Academic librarians thus need to constantly update or acquire new skills and knowledge to remain relevant and drive the organization forward.

Technological Factors

New technologies and knowledge management systems are being designed as the demand for integration and application of these technologies in library services and practices is increasing. As stated by Bulan and Sensuse (2012), information technology (IT) facilitates and encourages knowledge sharing, and it is an important intercession in knowledge sharing as it is used to connect employees and facilitate interaction and access to data, which supports their daily activities. Therefore, well-established IT infrastructure facilitates knowledge sharing practices by linking information communication structure such as data processing, storage, and communications systems (Becerra-Fernandes & Sabherwal, 2010). Kant and Singh (2008) also underlined the importance of IT in enabling collection, storage, and indexing and linking data and digital objects in order to support management decisions. The use of IT facilitates information search, access, and retrieval (Lin, 2007). Technology has the ability to offer instant access to large amounts of data and knowledge and to enable long distance collaboration that facilitates a team approach, both in and between business functions (Riege, 2005).

Ruddy (2000) further argued that improving knowledge sharing in a meaningful way requires a delicate marriage of technology with a keen sense of cultural or behavioral awareness. Knowledge sharing within academic libraries can therefore be effective if these institutions are using modern technologies whereby individuals have a chance to interact within and outside of their organization. Wasko and Faraj (2005) further noted that technology enables academics to create linkages to external resources, which makes it possible to share knowledge hastily and globally with a large number of people. Knowledge sharing cannot be separated from the use of technology since it helps to facilitate communication and sharing of information efficiently. The strength of the knowledge sharing model is its incorporation of organizational, individual, and technological factors, which involve interactions and trust, organizational culture, IT systems, and social networks that facilitate and promote knowledge sharing.

METHODOLOGY

This study explored literature to critically analyze the adoption of modern technologies in knowledge sharing in academic libraries in South Africa, using content analysis. For this current study, content analysis was introduced and applied in reviewing literature on journal articles reporting on knowledge management and knowledge sharing practices in academic libraries, following the guidelines advanced by Kitchenham (2004). The review protocol was composed of the following elements.

Inclusion Criteria

The inclusion criteria aimed to identify studies that provide direct evidence about the research question (Kitchenham, 2004). The review process thus began with the researcher identifying and selecting documents on the basis of their usefulness and relevance to the study. The study conducted a literature review and empirical research on knowledge management and sharing, the adoption of modern technologies in knowledge sharing, barriers to effective knowledge sharing, and the determinants of knowledge sharing, to ensure inclusion of all the objectives of the study in the content analysis. However, only journal articles were included in the literature review and taken as a unit of analysis, as they included original research.

Search Strategy

The following search terms were used to find published articles reporting on knowledge management and knowledge sharing practices in academic libraries: knowledge management and knowledge sharing, benefits of knowledge sharing, determinants of knowledge sharing, the adoption of modern technologies in knowledge management and sharing in academic libraries, knowledge sharing systems, knowledge management systems, barriers to effective knowledge sharing, and knowledge sharing strategies. The search terms were used to collect data from related studies from ScienceDirect, Web of Science, EBSCOhost, Emerald, Springer, Wiley, Google Scholar, and Scopus, databases that provide access to publications in a variety of fields. Databases such as EBSCOhost are considered a suitable choice for systematic literature reviews as it allows using complex search strings and filters, which makes it easy to apply complex selection criteria (Wang & Noe, 2010).

Study Selection

The selection criteria included empirical studies published in a peer-reviewed journal focusing on knowledge sharing practices in academic libraries. Although many articles related to the study were generated, some of the articles were removed after thorough reading of the titles and abstracts, mainly because of their irrelevance to the topic of interest, research objectives, or lack of quality, and all the duplicates were removed, which considerably reduced the sample size.

Data Analysis and Synthesis

The thematic analysis technique or process developed by Braun and Clarke (2006) was used to systematically analyze the qualitative data or text extracted directly from the literature review and empirical studies on knowledge sharing practices, the adoption of modern technologies in knowledge sharing, and the determinants of knowledge sharing. The process of thematic analysis is outlined as follows.

Familiarization With the Data

Data familiarization was developed by reading the articles selected for review using the “repeated reading” approach to search for meanings and patterns.

Generating Initial Codes and Themes

The coding process was research-objectives driven and was developed through capturing aspects of knowledge sharing practices, the adoption of modern technologies in knowledge sharing, the barriers to effective knowledge sharing, and the determinants of knowledge sharing, which made it easier to assign relevant code. All codes were thus reviewed and collated to generate potential themes relevant to the research objectives.

Reviewing Themes

All of the themes were defined and common characteristics of the themes were outlined as per the objectives of this study, and this led to the development of higher-level themes composed of many subthemes. The knowledge sharing practices in academic libraries was a common thread connecting all the themes, which led to the development of main themes, such as the knowledge sharing practices, the adoption of modern technologies in knowledge sharing, the barriers to effective knowledge sharing, and the determinants of knowledge sharing.

Overview of Literature Review on Knowledge Sharing Practices in Academic Libraries

Knowledge is regarded as a fundamental resource critical to the long-term sustainability and success of any organization. However, valuable knowledge within libraries will remain local if the knowledge resources are not managed properly and if effective mechanisms for knowledge sharing are not in place. Cheng et al. (2009) described individuals as important because they are knowledge creators and knowledge sharers and further asserted that knowledge sharing is people's process, and the contribution of people in knowledge sharing is paramount in terms of knowledge production. According to Cheng et al. (2009), the effort of knowledge management will fail if individuals are not willing to share knowledge across the organization. The knowledge sharing practices may thus be hampered if the individuals lack willingness to share. Therefore, for effective knowledge sharing within academic libraries, individuals or employees should be involved in knowledge sharing practices and be willing to share their knowledge as that implies a positive attitude of the individual sharing knowledge with peers. Individual attitudes, trust, personality, motivation, willingness to share, and pleasure of sharing are also essential in knowledge sharing. Academic libraries globally thus need to place great emphasis on improving the effectiveness of knowledge sharing by implementing and adopting strategies and innovative technologies such as the IoT, cloud computing, blockchain, just to name a few. These new breakthrough technologies, the IoT in particular, change the way knowledge is managed and shared within organizations, forcing the implementation of innovative knowledge management systems and an open approach to supporting knowledge flows. Academic libraries worldwide are increasingly taking advantage of opportunities for proper knowledge management and improving knowledge sharing among staff members and users by using these innovative technologies.

FINDINGS FROM LITERATURE REVIEW

The findings are discussed in line with the study objectives.

Adoption of Modern Technologies for Knowledge Management and Sharing in Academic Libraries

Generated knowledge continues to increase in multiple formats in academic libraries and, if they are not properly managed, there can be a delay or no access to this vital resource. Therefore, the more efficient the management of knowledge, the more effective access and sharing are. However, libraries and other information agencies are faced with the challenge of organizing, sharing, and managing their hybrid knowledge resources in this digital era. Large organizations and institutions thus need to sustain the actual transfer of knowledge using their knowledge processes, technical capability, and organization capabilities (Al-Shawabkeh et al., 2022). One of the prime objectives of knowledge management is the effective sharing of knowledge originated from reliable sources.

The application of modern technologies, such as the IoT and blockchain, is imperative to pinpoint issues pertaining to innovative strategies for knowledge management and sharing within academic libraries. These technologies have transformed the way knowledge and information have been managed across different organizations and are easily making knowledge accessible from anywhere.

The IoT, blockchain, artificial intelligence, cloud computing, and other modern IT solutions may largely improve the effectiveness of knowledge management and sharing processes in this technology-driven era. These modern technologies offer potential for not only real-time updates and synthetic evaluation of data from various sources, but also the capacity for knowledge creation, discovery, and sharing. Therefore, proper knowledge management and sharing enforce organizations and institutions to reimagine the best practices and strategies and adopt new innovative technologies such as the IoT and blockchain technologies.

Internet of Things Technologies

Badimo (2017) described the IoT as the general idea of physical objects that are seamlessly integrated into the information network, that are readable, recognizable, locatable, addressable, and controllable via the internet. The IoT is a dynamic and global network infrastructure, in which “things” are expected to communicate among themselves and interact with the environment by exchanging data generated by sensing, while reacting to events and triggering actions to control the physical world (Liu, 2017). As pointed out by Badimo (2017), the IoT is at the core of digital transformation with 73% of executives either researching or currently deploying this technology. Abu-Elkheir et al. (2013) identified a number of design primitives that determine the logical and physical structure of data management solutions for the IoT, which are organized into three main dimensions, namely, data collection, data management system design, and processing. Data collection elements target the discovery and identification of things and subsystems while data management system design elements address how data are to be stored and archived while processing elements deal with the actual access to data storage (Abu-Elkheir et al., 2013).

IoT applications have been extended from industry to education in recent years. Apart from its extensive practical implications in various fields of life, libraries have started to implement IoT-based systems over the past few years to enhance access to the library material and to provide efficient services to students and users. The IoT is a recent technological shift that librarians should be aware of because it has the potential to enhance knowledge and information resource management. IoT-based libraries are remotely monitoring the infrastructure, data transmission, and control of the whole ecosystem intelligently (Cao et al., 2018). The IoT can assign heightened security levels to documents with the ability to recognize confidential documents and prevent unauthorized access to digital information in academic libraries. IoT devices can help academic libraries with document location and maintain security access levels.

Several studies on the adoption and benefits of using the IoT within academic libraries have been reported worldwide. For example, Fleisch (2010) identified the value drivers of IoT application to businesses and proposed that this technology could provide management systems with low-cost data about the real world. Pujar and Satyanarayana (2015) also investigated the benefits of the IoT for libraries and proposed innovative approaches such as a virtual library card, smart digital shelves, cloud services, and integrating of RFID (radio frequency identification) tags or member cards to access the library and its resources. Wojick (2016) also explored the potential impact of the IoT on library services and proposed a theoretical model of IoT application in library services that librarians can use to improve services through sharing information, tracking and tracing services, and pushing notification services. Oyelude (2016) introduced an innovative application of the IoT in Oracle Digital, delivering value-added service through the cloud platform for library use. Massis (2016) explored the potential impact of the IoT on the library from the security and privacy points of view and proposed the “security of things” and security management approaches. Ibrahim and Kamalrudin (2018) analyzed the security requirement for IoT application in libraries and proposed a method to identify security concern with IoT application. Renold and Rani (2013) designed a system with RFID technology for the use of library management such as stock management, tracing misplaced and misshelved books, and promoting easy access to library materials. Liu (2017) analyzed the integration

of library information resources in a digital way and proposed a library data resource object model and the process of library personalized information service management.

Blockchain Technologies

Blockchain technology emerged as an attempt to offer a solution to the long-lasting problem of third-party involvement in the management, exchange, and sharing of information among people. Sarmah (2018) described blockchain technology as an integrative and decentralized database developed to record, validate, maintain, make public, and distribute records of transactions among clients on the same network. It is a new decentralized technology that can potentially improve knowledge management and sharing and address the challenges faced by academic libraries. It is a highly secured and dependable transactional and information database that has received global recognition as a global record-keeping mechanism and has been found effective in managing big data (Muheidat et al., 2022). Blockchain is a digital distributed ledger that records and stores data in the form of blocks that are linked together using a cryptographic function (Tripathi et al., 2023). It allows for secure storage and data sharing (Mistry, et al., 2020). As noted by Kawaguchi (2019), instead of all the databases on the network maintaining their separate data set, every user has controlled access to a shared data set. Tapscott and Tapscott (2016) described blockchain as incorruptible, programmable to record not just financial transactions, but virtually everything of value. “Bitcoin” (2016) further described a blockchain as a distributed ledger of all transactions, which are recorded in discrete blocks and linked together in a chain, and each block contains private data and a public header that is used to link to the next block on the chain. The blocks or data records allow everyone on the network an adequate access to the activities of other users and, once these blocks are collected in a chain, they cannot be manipulated, altered, changed, or deleted by a single actor; instead they are verified and managed using automation and shared governance protocols (“What Is Blockchain Technology?” 2016). Data records are immutable and encrypted, and they can be shared within a group of people, organizations, or a community (Shaw, 2016). The shared document is encrypted and verified to ensure that the data it stores are always correct, and every record added to the blockchain ledger has a unique key associated with it that can be trusted (Shaw, 2016). The use of unique key encryption is thus important as it enables the owner of the information to control it without giving up personal information like names or social security numbers (Shaw, 2016). There are three main attributes of blockchain, namely, decentralization, trust, and immutability. Blockchain allows decentralized marketplaces and collaboration platforms, including computational power data and algorithms, to be used for several artificial intelligence elements (Manogaran, et al., 2020).

Blockchain technology can therefore improve confidence, accountability, protection, and privacy in business units by supplying a shared and decentralized distributed directory (Wang, et al., 2020). The idea behind the concept of blockchain technology was to remove all barriers to the free flow of digital currency among clients in a block network across the globe through cryptography. It thus applies cryptography as a security mechanism in which every individual record, transaction, and message is cryptographically signed, thereby reducing the incidence of network hacking, data mutilation, and data compromise (Kawaguchi, 2019). Bitcoin has successfully applied blockchain technology as data sharing or exchange model to allow free movement and exchange of digital currencies and information across different national and international locations.

BARRIERS TO EFFECTIVE KNOWLEDGE SHARING IN ACADEMIC LIBRARIES

In order to break through the barriers to knowledge sharing, academic libraries need to, first, identify the barriers that prevent the free flow of critical information and the intellectual capital of the institution. By understanding some common barriers to knowledge sharing, academic libraries will be able to break through the barriers to effective knowledge sharing and develop the strategies to overcome these barriers. However, it is still challenging to adopt innovative technologies such as

blockchain, cloud computing, and the IoT for effective knowledge sharing within academic libraries although knowledge management has existed for such a long time. The problems relating to poor IT infrastructure, lack of IT knowledge and skills, lack of technical support, and lack of IT training make it difficult for academic libraries to maximize the full benefits offered by these technologies (Masenya, 2020). There is also a distinct lack of understanding of modern technologies and, as a result, librarians and archivists struggle to see how they can be incorporated into their institutions or organizations. As noted by Li et al. (2015), implementing the IoT could be affected by all connected objects, and it is thus a challenge to integrate this technology with the current information systems. IoT security protection and privacy may become a limit for its development in academic libraries (Weber, 2010). The standardization also plays a key role for the full deployment of modern technologies, that is, the rapid development of the IoT makes standardization difficult in different organizations (Liu, 2015). Other barriers to effective knowledge sharing include the following.

1. Lack of time to share knowledge or time to identify colleagues in need of specific information.
2. Difficulties in integrating a knowledge management strategy and sharing initiatives in line with the organization's goals.
3. Lack of the proper tools and systems for managing and sharing knowledge within the organization.

Riege (2005) also identified the following barriers to effective knowledge sharing: lack of integration of IT systems and processes impedes knowledge sharing practices, lack of technical support, integrated IT systems obstruct work routines and communication flows, unrealistic expectations of employees as to what technology can do and cannot do, lack of compatibility between diverse IT systems and processes, mismatch between individuals' need requirements and integrated IT systems and processes restricts knowledge sharing practices, reluctance to use IT systems due to lack of familiarity and experience among employees, lack of training on the use of emerging technologies, and lack of communication and demonstration of all advantages of any new system or technology over existing ones. Several scholars further identified some of the common barriers that affect knowledge sharing in most organizations. As noted by Walsham (2001), ineffective leadership may affect the ability of an organization to organize, analyse, and disseminate knowledge as expected by the stakeholders. According to Lambe (2011), trust is another common barrier that always affects the efficiency of the knowledge sharing in many organizations. When the stakeholders lack trust in one another, they tend to withhold some important information and knowledge (Lambe, 2011). The organizational structure or the reward mechanism may affect effective knowledge sharing (Wilson, 2002). Carneli et al (2013) also outlined the following barriers to effective knowledge sharing and how to break through these barriers, namely, hoarding barrier, search barrier, and transfer barrier.

Knowledge Hoarding Barrier

Organizations and institutions have introduced knowledge management systems and technologies to promote knowledge transfer between employees, but these have been unsuccessful in most cases (Connelly & Kelloway, 2003). Knowledge sharing success has been subtle regardless of the efforts and mechanisms that are put in place to increase knowledge sharing within organizations. In many instances, employees are not willing to share knowledge and are hoarding vital knowledge even though organizational practices are followed to facilitate transfer. This reluctance to transfer or share knowledge persists even when employees are encouraged and rewarded for doing so (Bock et al., 2005). Knowledge hoarding entails hesitation or unwillingness to share knowledge among colleagues or with the organization as a whole. In many cases, knowledge hoarders believe that knowledge is power and, by sharing what they think, they may decrease their value to the organization and potentially put their jobs in jeopardy.

Organizations do not own the intellectual assets of employees, and they therefore cannot coerce or force workers to transfer their knowledge to other organizational members (Kelloway & Barling,

2000). The deficiency of knowledge sharing within an organization may be the result of problems with unconducive work environment, culture, organizational structure, lack of sponsorship, lack of time, organizational systems and programs, as well as misaligned measures (Das & Chakraborty, 2018). In some cases, competition within the organization can lead employees to hoard information in an attempt to retain a competitive advantage whereas, in other situations, employees hoard knowledge as they are afraid of losing power and believe that knowledge will protect their power and help them remain valuable to the organization. If an organization's compensation model emphasizes individual achievement, then employees tend to focus on their own targets rather than sharing information to help other people achieve their own goals. In other organizations, employees may be too busy to help others, and even employees with the best of intentions may end up inadvertently hoarding information as they do not have time to share.

Knowledge Search Barrier

The search barrier involves the inability to find information within the organization. People with lack of research skills, technical skills, and knowledge of using knowledge management systems and modern technologies find it more difficult to locate and access the information they need in the wake of the digital transformation era. Information overload also creates a search barrier since the sheer volume of information makes it hard to find the information needed. Poor IT infrastructure, lack of IT knowledge and skills, lack of technical support, and lack of IT training also make it difficult for employees to search for information and knowledge when using innovative technologies.

DETERMINANTS OF KNOWLEDGE SHARING IN ACADEMIC LIBRARIES

The well-designed organizational structure, culture, and knowledge management strategy enable effective knowledge sharing and collaboration across boundaries within organizations and institutions. Syed and Rowland (2004) argued that knowledge sharing will be successful with the support of an organizational structure that allows the flow of information between divisions with fewer restrictions. Gold, et al (2001) concurred that the formal organizational structures within the universities may encourage interactions among academics, which enhances effective knowledge sharing. Riege (2005) stresses that successful knowledge sharing depends on organizational culture and structures that facilitate transparent knowledge flows. Noor and Salim (2011) pointed out that an organization is a social entity where knowledge sharing takes place, and it enables knowledge to be created, captured, organized, and shared among individuals who are the key actors in implementing knowledge sharing practices.

Organizations are dealing with policy formulations, structures, cultures, reward systems, work processes, and management support that enable organizations to maximize knowledge sharing practices. Various studies have proven that knowledge sharing is closely related to the organizational context (Foss et al., 2010; Quigley et al., 2007; Wang & Noe, 2010). There is thus the need for a comprehensive understanding of organizational context factors that might regulate employee knowledge-sharing behavior and provide rules for various types of knowledge exchange or sharing (Widjaja, 2019). Knowledge management strategy is one of the best approaches to drive business performance and the competitive advantage of the organization in the knowledge-based economy. Hansen et al. (1999) further identified two strategies for managing and sharing knowledge in an organization: codification and personalization strategies. Codification strategy is a people-to-documents approach that involves securing explicit knowledge in the form of databases for others to access and reuse (Ng et al., 2012), and it enables all authorized employees to retrieve the codified knowledge and share their expertise via electronic devices. This codified knowledge is thus acquired, saved, refined, improved, and reused within the organization, and it is presumed to be effective for the organizations whose business strategy requires reusing of existing knowledge. This strategy can also be most appropriate whereby technology is the most utilized form of information creation and transfer

and where social ties are weak, as there is little social interaction between individuals. Therefore, the organizations that implement a codification strategy will invest heavily into IT to codify, store, and transfer explicit knowledge to all members within the organization.

Personalization strategy is based on a person-to-person approach or personal interaction, and it is often practiced by organizations to develop highly customized solutions to unique and complex problems (Ng et al., 2012). This strategy focuses mainly on discussion between individuals, unlike codification strategy that focuses mainly on explicit knowledge captured and available in databases. Personalization strategy will require far less IT investment as technology is only required to facilitate social relationships within the organization. The use of the personalization strategy would best complement knowledge transfer in social groups such as communities of practice whereby knowledge is shared informally. A combination of both codification and personalization strategies is, however, recommended in this era of digital transformation, in order to provide effective knowledge sharing in South African academic libraries.

Percin (2010) suggested a new knowledge management strategy called integrated approach or strategy, which integrates both personalization (human-oriented) and codification strategies (system-oriented). On the other hand, Sarawanawong et al. (2009) also proposed a hybrid knowledge management framework development strategy in higher education whereby personalization strategy or human-oriented style (or people-to-people) plays a leading role while codification (or people-to-document) plays the supporting roles. In the context of this study, integrated approach can be used whereby personalization strategy includes knowledge identification, knowledge creation, and knowledge acquisition through social interaction groups and community of practice groups, for example, while the codification strategy includes knowledge organization, knowledge storage, knowledge distribution, and knowledge application involving appropriate use of Information and Communication Technology (ICT) enabling tools. The study conducted by Jain et al. (2007) also revealed that the sharing of knowledge among the academic staff is influenced by the following factors: culture, motivation to share, willingness to share, knowledge management support, trust, teamwork spirit, and the degree to which knowledge is considered as a source of power. However, Syed-Ikhsan and Rowland (2004) pointed out that it is unrealistic to assume that all employees are willing to easily offer knowledge without considering what may be gained or lost as a result of this action. Moreover, individuals expect to receive a reward or incentive regarding their work. The study conducted by Cheng et al. (2009) on knowledge sharing among academics in Malaysia, using the knowledge sharing model, identified incentive systems and personal expectations as some of the key factors driving academics to engage in knowledge-sharing activities. The strengths of the knowledge sharing model is that it contains important elements needed in knowledge sharing such as organizational culture, structure, leadership, management support and commitment reward systems, individual attitude, personal expectations, and IT applications (Sawsan & Lyn, 2015). Therefore, to share or not share knowledge may be influenced by the individuals' personal expectations.

Organizational rewards and incentives (monetary or nonmonetary) may also motivate and influence knowledge sharing among academics or employees within the organizations. Monetary rewards thus seemed to have an immediate effect on motivation of knowledge sharing, as noted by Kugel and Schostek (2004). Hall (2001) further proposed implicit rewards like reputation and status as motivation for academics to share knowledge. In addition, technology facilitates, encourages, and supports knowledge sharing within organizations. Wangpitatwong (2009) also noted that technology supports, influences, and increases ability to share knowledge. Chong and Besharati (2014) observe that organizational hierarchy, individual trust, and knowledge sharing technological systems have direct relationships with knowledge sharing. Technological factors such as IT infrastructure and application enhance knowledge sharing and lower communication barriers between participants (Bulan & Sensuse, 2012). Lin (2007) also conducted a study on the influence of individual, organizational, and technological factors on knowledge sharing, and the results show that individual and organizational factors significantly influence knowledge-sharing processes. In their study, Ismail and Yusof (2008)

further investigated how individual, organizational and technological factors were used to leverage the knowledge of their staff and noted that the organizations and staff members need to consider all these factors as the determinants of knowledge sharing.

BREAKING THROUGH THE BARRIERS TO EFFECTIVE KNOWLEDGE SHARING

As noted by Hansen et al. (1999), the barriers to effective knowledge sharing are categorized as problems of either motivation or ability. A motivation barrier is manifested by unwillingness to share or hoarding barriers, and this requires management solutions that will help shift culture and individual motivations. Hansen et al. (1999) further recommended cultivating “T-shaped management” that builds depth within a specific discipline, while encouraging breadth across the organization by establishing an expansive individual network that helps diminish the insular tendencies that underlie the not-invented-here and hoarding barriers. Institutions such as academic libraries must reward employees for knowledge sharing and for their assistance to people outside their group, as well as for their achievements against their own goals. Academic libraries can also address knowledge sharing barriers by implementing emerging or innovative technologies or improving technological infrastructure. However, even if the organization has technological infrastructure that is properly deployed, there is still a need for people with technical expertise, and these institutions should thus equip the staff members or employees with technical skills. Bilginoğlu (2019) recommended the following strategies for creating a knowledge-sharing culture within the organizations.

1. The right environment for knowledge sharing should be established by integrating knowledge sharing practices into strategic business objectives, human resources practices, and the organization’s culture.
2. As knowledge is perceived as power, employees should be convinced that the benefits of sharing outweigh the costs of losing this perceived power.
3. Top management should believe that power comes from sharing knowledge and not from hoarding it, and act accordingly.

Other strategies to promote effective knowledge sharing within the organizations include appreciate and reward knowledge sharing, creating effective knowledge sharing environments and building nimble networks, as summarized by Payne (2018).

Appreciating and Rewarding Knowledge Sharing

Academic libraries should provide incentives to knowledge sharing and establish practices that demonstrate appreciation and reward knowledge sharing, and libraries should use this platform as a service center to appreciate and reward those who are sharing knowledge (Payne, 2018). The knowledge-sharing reward system, recognition, and financial incentive should be known within the organization.

Creating Effective Knowledge Sharing Environment

The academic libraries should create effective knowledge-sharing environments and have templates for writing knowledge articles, host brown-bag knowledge-transfer lunches, and establish mentor arrangements with knowledge-sharing experts. The institution should build knowledge-capture skills among their employees so that, each time they escalate a problem to an expert, they can also capture the knowledge and insert it into the “find, fix, finish, exploit, analyze, and disseminate” cycle (Payne, 2018).

Building Nimble Networks

For overcoming the barriers to knowledge sharing, Hansen et al. (1999) suggested building nimble networks across an organization that show how people actually work together and further recommended that these networks be results-based to ensure that they are productive. These nimble networks should be built for specific purposes and be able to create opportunities for people from various parts of the organization to meet and mingle. However, if the problem is sharing knowledge across offices, the organization should encourage communities of practice that span geographies.

CONCLUSION AND RECOMMENDATIONS

This article reviews literature on previous studies reporting on the barriers to knowledge sharing and strategies to break through these barriers. It is evident that modern technologies such as the IoT and blockchain technologies have become an indispensable element of modern technological solutions employed by organizations for effective knowledge management and sharing. Although academic libraries made their first step in the management of knowledge in networked environments, they are still faced with challenges hindering effective knowledge sharing among employees. The challenges include lack of understanding of knowledge management and sharing systems, poor IT infrastructure, lack of IT skills and technical support, lack of organizational commitment, poor management support, and inadequate resources. The digital transformation era has also shown that if organizations and institutions do not adapt with modern technologies, they struggle or fail. Academic libraries in South Africa thus need to adapt to this fast-changing environment, reimagine innovative strategies, and reinvent and embrace change. It has also been posited that in order to take advantage of the benefits and adoption of modern technologies in academic libraries, archivists, librarians, and information professionals need to have the necessary skills and knowledge to do so. In addition, staff should be encouraged to attend knowledge management and sharing conferences, workshops, and seminars as that will also keep them abreast of emerging trends and technologies in understanding knowledge management and sharing practices.

Policies and legislative frameworks for knowledge management and sharing also need to be developed. The study recommends that academic libraries consider exploring the possibility of benchmarking and collaborating with other key sectors as that will benefit them in deploying innovative systems in knowledge management and sharing. Knowledge sharing can thus be used as a significant competitive advantage; therefore, facilitating the sharing of knowledge remains foundational for growth and development, and it is important that any institution or organization, whether dealing with barriers or not, makes it easy for all team members to transfer knowledge into the service of the organization.

FUTURE RESEARCH AND IMPLICATIONS

This study discusses the breakthrough barriers to knowledge sharing and provides ways in which academic libraries can share knowledge through using modern technologies. Knowledge is not an individual but organizational asset. It is thus important for library managers to determine the potential barriers that hinder knowledge sharing, among others, knowledge hoarding. Future research should thus focus more on understanding knowledge hoarding and its implications for organizations, managers, and employees, as well as the reasons why the individuals are hoarding their knowledge. Organizations and institutions globally thus need to abandon their ideas of knowledge hoarding and embrace knowledge management and sharing, in order to remain competitive in the knowledge-based digital economy. Understanding effective methods, systems, and technologies for sharing knowledge is thus imperative, and future research should focus on how effective knowledge-sharing systems and knowledge-sharing reward systems can be implemented within academic libraries. Knowledge-sharing research should also adopt a co-design approach that is based on participatory action in

designing and developing effective knowledge-sharing systems, strategies, and models applicable to academic libraries.

CONFLICTS OF INTEREST

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